BACHELOR THESIS / MASTER THESIS

Investigation of air flow and temperature in a tertiary explosion-proof test chamber using CFD

Chair of Numerical Fluid and Gas Dynamics, BTU Cottbus-Senftenberg
YIG Advanced Modeling and Simulation of Transfer Processes for Next Generation Energy Systems, Scientific Computing Lab, Energy Innovation Center (EIZ) Cottbus
Weiss-Technik GmbH, Balingen

Synopsis – Lithium ion batteries offer a high energy density, which is the enabling technology for powerful portable electronic devices. The trade-off is security hazards that are associated with thermal runaway under extreme environmental conditions. Controlled destruction test are required, which is offered by explosion-proof test chambers. The goal of this thesis is to make suggestions for the improvement of internal aerodynamics of the *ExtremeEvent* test chamber, enhancing both ventilation efficiency and thermal homogeneity.

Tasks

- Familiarization with relevant technical details and functionality of the *ExtremeEvent* test chamber
- Mesh generation based on CAD files, preferably using open-source software such as *salome*, *gmsh*, *snappyHexMesh*, among others
- Setting up simulation cases based on geometric, thermal and flow-related boundary conditions, preferably using open-source CFD software such as *OpenFOAM*
- Carrying out steady-state and transient simulations, initially without and later with heat transfer
- Evaluation and documentation of the results and the workflow ensuring reproducibility

Mandatory skills and/or requirements

- Student of a STEM study programme or a closely-related discipline
- Interest in fluid flow simulations for engineering applications (R&D)

Desired skills

- Knowledge of fluid mechanics, computational fluid dynamics (CFD), and/or numerical methods
- Knowledge of CFD and CAD software (ideally *OpenFOAM* and *FreeCAD*)
- Proficiency in Python, C/C++, or another higher programming language (like Fortran, MATLAB, . . .)
- Scientific attitude: curiosity, self-motivation, and critical reasoning

---

Contact

- **Dr. Marten Klein** (`marten.klein@b-tu.de`)

`https://www.b-tu.de/en/fg-stroemungsmodellierung`
`https://www.b-tu.de/en/energie-innovationszentrum`
`https://t1p.de/qerdg`
`https://www.weiss-technik.com/en`